COMPUTROL INC.

No Container-No Fill

Control System Manual

WARNING

To ensure that the equipment described by this Manual, as well as the equipment connected to and used with it, operates satisfactorily and safely, all applicable local and national codes that apply to installing and operating the equipment must be followed. This includes the National Electrical Code in the USA and other applicable legislation, regulations, and codes in practice elsewhere. Since codes can vary geographically and can change with time, it is the user's responsibility to determine which standards and codes apply, and to comply with them.

FAILURE TO COMPLY WITH APPLICABLE CODES AND STANDARDS CAN RESULT IN DAMAGE TO EQUIPMENT AND/OR SERIOUS INJURY TO PERSONNEL.

Persons supervising and performing installation or maintenance must be suitably qualified and competent in these duties, and should carefully study the User Manual and any other manuals referred to by it prior to installation and/or operation of the equipment.

The manufacturer accepts no liability for any consequences resulting from inappropriate, negligent or incorrect installation, operation, or adjustment of the equipment.

The contents of the User Manual are believed to be correct at the time of printing. However, no responsibility is assumed for inaccuracies. In the interests of a commitment to a policy of continuous development and improvement, the manufacturer reserves the right to change the specification of the product or its performance or the contents of the User Manual without notice.

Table of Contents

TABLE OF CONTENTS

Table of Figures

1. INTRODUCTION

This section describes the features of the NC-NF package. This includes the functional description, alarms detected, and the interlocks between control package and existing control system, etc.

1.1 FEATURES

The NC-NF is designed to work in conjunction with the existing controls of a food/beverage filling station. The system performs the following functions:

1.   Speed compensated Lockout Actuator control at speeds in excess of 2000 CPM (up to two station advance).

2.   Lockout Response Calibration: Automatic determination of lockout response for use as extend and retract lead times.

3.   System Ready Interlock: dry contact interlock to indicate to the existing control system that NC-NF system is ready for production.
   1.   Module Fault protection: The NC-NF module contains a comprehensive fault detection routine that verifies the proper operation of the module at all times.
   2.   Machine Run Enable Interlock: The summation of no active alarms.

4.   Data Acquisition: Total number of containers filled and total number of lockouts, (for the current shift, the previous shift, and the lifetime of the system).

5.   Built-in 2 Line X 40 character sealed display with 24 key membrane keypad
   1.   Comprehensive status messages to aid in troubleshooting
   2.   Local viewing of collected data
   3.   Set-up parameters (viewed by operator, changed by authorized personnel)
   4.   Alarm reset
   5.   Local Wash-Down Bypass mode
   6.   End of shift data transfer

6.   User Adjustable Parameters (protected):
   1.   Lockout Actuator Extend Lead Time.
   2.   Lockout Actuator Retract Lead Time.
   3.   Maximum allowed Lockout response time.
   4.   Number of stations Container Sensor to Lockout solenoid.
   5.   Automatic End of Shift Timer.
   6.   Number of consecutive Lockouts to extend Pull-out Cam.
   7.   Enable Optional Sensors (Infeed and/or Discharge).
   8.   * Number of stations Infeed sensor to Container sensor.
   9.   * Number of missing containers to constitute an Infeed Jam.
   10.   * Infeed Low Timer (0.1 second time base).
   11.   * Infeed Restart Timer (0.1 second time base).
   12.   * Number of stations Infeed sensor to Discharge sensor.
   13.   * Number of missing containers to constitute a Discharge Jam.
   14.   Input Polarity

* Parameter only accessed if related sensor is enabled

7.   Alarm Detection
   1.   Timing Sensor Failure
   2.   Lockout Extend Too Slow
   3.   Lockout Retract Too Slow
   4.   Can Detected in Wash-Down Bypass Mode
   5.   Infeed Jam
   6.   Infeed Low
   7.   Discharge Jam

8.   The NC-NF package can be setup as a dedicated "black box" or as a fully programmable PLC implementing the high performance SYSTEMS M4502 PLC that allows easy customization by Computrol or the end user. The M4502 module is programmed using the DOS-based SYSdev programming package which allows the module to be programmed in any combination of Ladder or high-level (subset of "C"), as well as perform on-line monitoring, troubleshooting and module fault diagnostics.

CHAPTER 1
INTRODUCTION

1.2 FUNCTIONAL DESCRIPTIONS

1.2.1 Lockout Actuator Control

The NC-NF provides direct control for the No Can-No Fill Lockout Actuator Solenoid(s). The actuator is controlled by the Container Sensor, working in conjunction with the fill station Timing Sensor, such that when the Container Sensor **does** detect a container somewhere between fill station timing signals, the Lockout Actuator will not be activated. However, when the Container Sensor **does not** detect a container between timing signals, the Lockout Actuator will be activated at a precise time to "hit" the lockout pin to prevent an empty station from being filled. As soon as the Container Sensor begins detecting containers again, the actuator will be retracted to prevent any containers from not being filled.

The reaction of the Lockout Actuator is speed compensated. This means that as the speed of the machine increases, (time period between fill stations decreases), the activation and deactivation point of the actuator will be advanced to compensate for the speed of the machine and the reaction time of the actuator. If the sensed reaction time of the Lockout Actuator exceeds the user defined response time maximum, an alarm will be generated.

1.2.2 Pull-Out Cam Control

The NC-NF provides control for the Pull-out Cam Actuator Solenoid(s). When the Pull-out Cam is retracted it resets the lockout pins for the next revolution. As long as a normal flow of containers is detected, the Pull-out Cam will stay retracted. If there is a predetermined (setup parameter) number of consecutive lockouts, the Pull-out Cam will be extended to reduce wear and tear on both the Pull-out Cam and the Lockout Actuator.

1.2.3 Wash-Down Bypass Mode

The NC-NF system provides for a Wash-Down Bypass condition. This can be activated through the module keypad or through a remote signal from the existing controls. When the system is in Wash-Down Bypass, the Lockout Actuator and Pull-out Cam are locked in the to-fill position, production and lockout counts are frozen and most alarms are disabled. Because the Lockout Actuator is locked in position and fill counts are frozen, the NC-NF system is not expecting to detect any containers throughout the system. If the Container Sensor detects a container while the system is in Wash-Down Bypass mode, an alarm is latched and the system enable interlock will be turned off.

2. INTERLOCKS WITH EXISTING CONTROL SYSTEM

The NC-NF system will need to exchange information with the existing filler controls. These pieces of information are broken down into two categories: outgoing (from NC-NF to filler) and incoming (from filler to NC-NF).

2.1 OUTGOING INTERLOCKS

The following are signals from the NC-NF to the existing control system.

2.1.1 System Ready Interlock

This dry contact interlock indicates to the existing control system that the NC-NF system is ready for production. The contact will close when the NC-NF system is ready. It is recommended that if the System Ready interlock is off, the filler should not run. The System Ready Interlock combines the following:

2.1.1.1 Module Fault Protection

The NC-NF module contains a comprehensive fault detection routine that verifies the proper operation of the module at all times. The sources of these faults range from a hardware failure of the module to an error in the loaded program. If a module fault is detected, all outputs are disabled.

2.1.1.2 System Enable

The system enable provides a summary of all alarms detected by the NC-NF software. When the System Enable signal is off, the Alarm Interlock should be referenced for the cause.

2.1.2 Alarm Interlock

The alarms are available to the host PLC via discrete +24VDC outputs (15, 16 & 17). These should be used to stop the machine and indicate the problem when any one of the following alarms occurs. The outputs will follow the following pattern:

Figure 2-1 Alarm Output Table

Value	Output 17	Output 16	Output 15	Highest Priority Alarm Active
0	0	0	0	None
1	0	0	1	Timing Sensor Failure
2	0	1	0	Lockout Extend Too Slow
3	0	1	1	Lockout Response Too Slow
4	1	0	0	Container in Wash-Down
5	1	0	1	Infeed Jam
6	1	1	0	Infeed Low
7	1	1	1	Discharge Jam

SECTION 2
INTERLOCKS

2.2   INCOMING INTERLOCKS

The following interlocks can be provided by the existing control system to the NC-NF.

2.2.1 Wash-Down Bypass (remote)

```
SYSTEM IN WASH-DOWN BYPASS BY REMOTE
```

This signal is used to trigger the Wash-Down Bypass mode of operation. This mode can also be entered through the keypad display, or a discrete remote signal. When the system is in Wash-Down Bypass, the Lockout Actuator and Pull-out Cam are locked in the to-fill position, production and lockout counts are frozen and most alarms are disabled. Because the Lockout Actuator is locked in position and fill counts are frozen, the NC-NF system is not expecting to detect any containers throughout the system. If the Container Sensor detects a container while the system is in Wash-Down Bypass mode, an alarm is latched and the system enable interlock will be turned off.

2.2.2 End of Shift (remote)

This signal is used to transfer the "Current Shift" data (total containers filled and total lockouts) to the "Previous Shift", and clear the "Current Shift".

2.2.3 Filler Running

This signal tells the NC-NF system when to look for the Timing Sensor signal.

3. INSTALLATION

This section gives instructions for installing the NC-NF system for the first time.

3.1 PACKING LIST

Verify that the following items are included when unpacking the NC-NF:

1ea.   NC-NF M4502 Module with required I/O.
1ea.   NC-NF Control System Manual.
1ea.   M4500 User's Manual.

3.2 POWER REQUIREMENTS

NC-NF (M4502) Module
Voltage: 115/230 VAC
Current: 0.5/0.3 A

NC-NF I/O (Sensors, Ouput Solenoids, etc.)
Voltage: 24 VDC
Current: Device dependent

Note that 24VDC solenoids must be used for the output solenoids. This is because DC solenoids provide a more consistent, repeatable response than AC solenoids.

The input power should be interlocked with the existing control system such that when the main disconnect of the existing control system is turned off, all power to the NC-NF is also turned off.

SECTION 3
INSTALLATION

3.3   INSTALLING THE NC-NF MODULE

The NC-NF is designed to mount from the front in the user's cabinet door. Use the cutout in Figure 3-1 for NEMA 12. Use the cutout in Figure 3-2 for NEMA 4 (wash-down area).

1) Remove all terminal connectors so that the module can easily slide into the recommended cutout.

2) Referring to the appropriate figure (see above), put a cutout in the door of the enclosure.

3) With the gasket installed on the M4502 mounting studs, slide the module into the cutout from the front. Attach the M4502 to the door with the supplied hardware. Once the module is installed, a lugged earth ground wire should be installed on one of the mounting screws to insure that the module is grounded.

4) In the case of NEMA 4 mounting, place the bezel over the front of the display. Be careful that the gasket forms a good seal with the front of the display. Attach with the supplied hardware.

4) Replace all terminal connectors on the module to begin terminating wires.
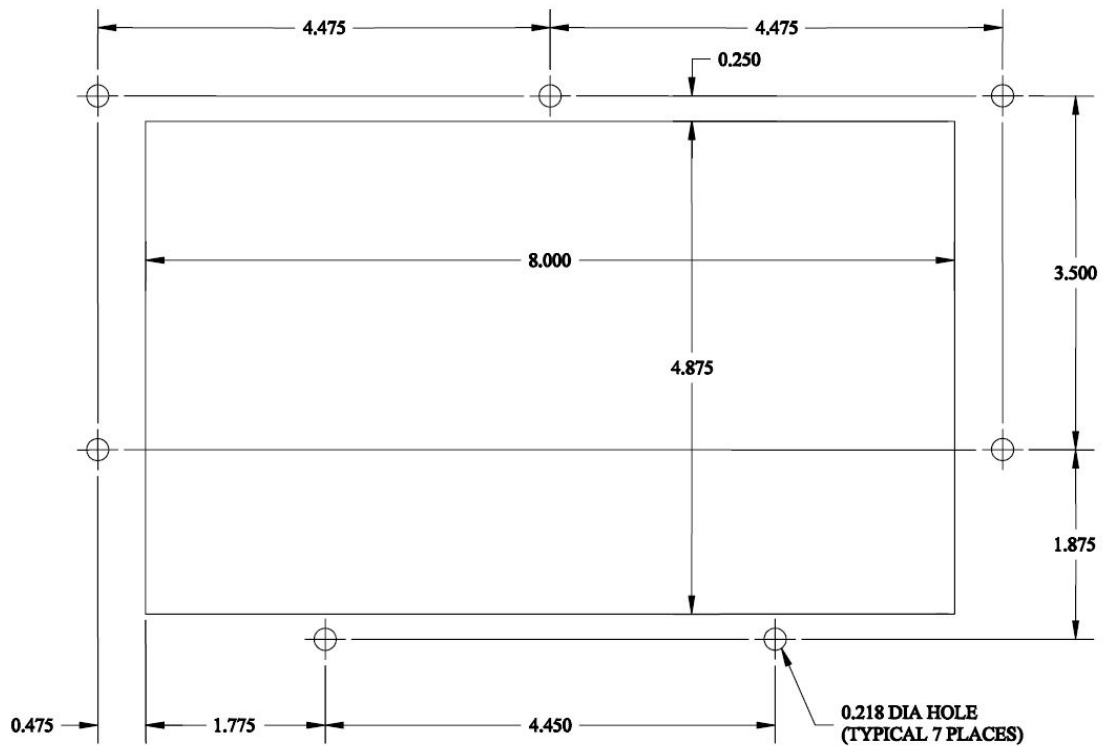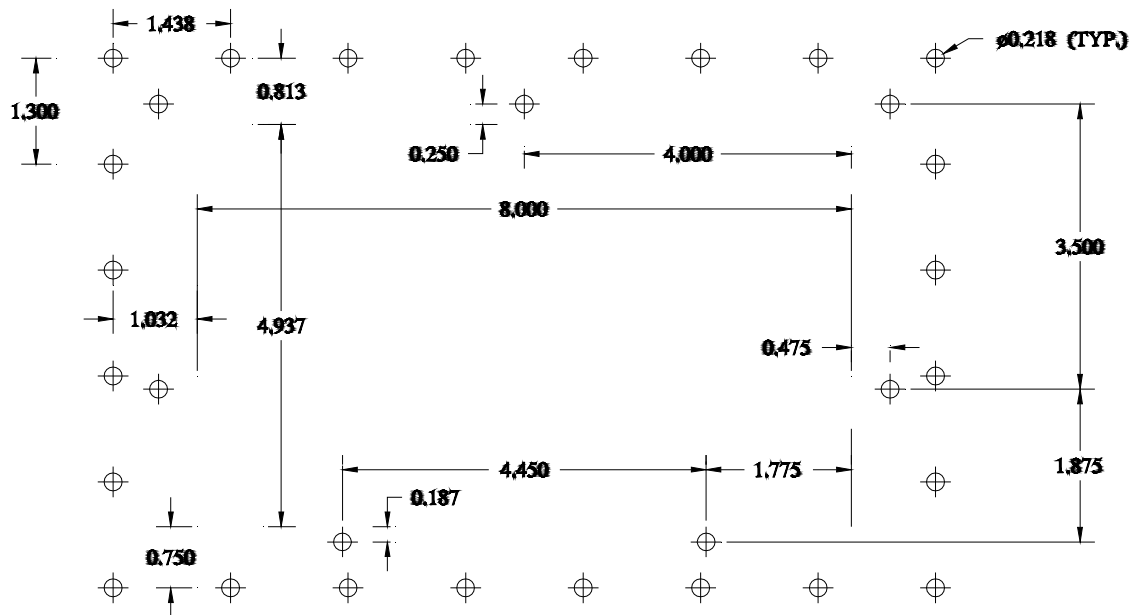
Figure 3-1: NEMA 12 Panel Cutout

ALL DIMENSIONS ARE SYMMETRICAL UNLESS OTHERWISE NOTED

Figure 3-2: NEMA 4 Panel Cutout

SECTION 3
INSTALLATION

3.4   WIRING TO THE NC-NF

Referring to the electrical control schematic in Appendix D, wire the NC-NF as follows:

3.4.1   Incoming Power

Be sure all power is disconnected before wiring the system. In general, when wiring the NC-NF, keep all +24VDC wiring away from high voltage wiring.

1. 110 - 240VAC 50/60HZ power to the M4502 NC-NF module.
2. +24VDC power to the S4568 I/O board and M4502 (for use with the input IN0).

3.4.2   Input Sensors

Connect +24VDC power to all input sensors. Note that pull-up resistors (4.7kΩ) may be required to provide a minimum load for sensors using NPN outputs. Check the specifications for the sensor model used. If no information on minimum load is available, install the pull-up resistor.

1. Container Sensor (PRX1).
2. Timing Sensor (PRX2).
3. Lockout Response Feedback Sensor (PRX5).
4. Infeed Sensor (PRX3) (optional).
5. Discharge Sensor (PRX4) (optional).

3.4.3   Setup Protection Input

Enable Setup Changes switch. A switch inside the panel is recommended to prevent unauthorized access.

3.4.4   Optional Remote Signal Inputs

1. Wash-Down Bypass (maintained).
2. End of Shift (momentary).

3.4.5   Outputs

Note that 24VDC coils must be used for all outputs.
1. Wire CPR Relay into NC-NF FLT Output (Note polarity of coil).
2. Wire CR1 Relay into Output 2 (Note polarity of coil).
3. Fill Lockout Solenoid(s).
4. Pull-out Cam Solenoid(s) (optional).

3.4.6   Interlocks Between Existing System and NC-NF

1. System Ready (dry contact) interlock to inputs on existing PLC.
2. Alarm Binary Code outputs to inputs on existing PLC.
3. Auxiliary contact from main drive to NC-NF.

SECTION 3
INSTALLATION

3.5   POWER-UP SEQUENCE

Once the connectors are wired and replaced in their respective sockets, apply 115/230VAC power to the M4502. The Power-Up sequence occurs as follows:

1. At initial power-up, the module is reset for approximately half a second. During this time, the fault interlock will be "off", and the "FLT", "RUN" and "PWR" LED's will all be "on". All outputs will be "off".

2. Once the reset cycle is complete, the module will begin to execute the NC-NF application program. The fault interlock will turn "on" (sink true low) and the "FLT" LED will turn off.

3. If the red "FLT" LED stays on after the power-up is complete, read the fault code in the M4502 module, (see section 6.2 of the M4500 User's Manual for information on viewing fault codes with SYSdev.)

3.6   MODIFY EXISTING PLC PROGRAM

Modify the existing control system PLC program to interface with the NC-NF by incorporating the following into the existing PLC logic:

1. Add the "System Ready" output from the NC-NF as an input into the existing control system to immediately disable the main drive upon loss of signal. This can also be used as a "Summary Alarm" input.

2. Add the necessary logic to process the Alarm Binary Code outputs from the NC-NF.

3. Add Remote Wash-Down signal from output of existing system to input of NC-NF (optional).

4. Add Remote End of Shift signal from output of existing system to input of NC-NF (optional).

4. SETTING UP

Setting up the NC-NF system involves two steps: setting up the sensors and setting up the system parameters.
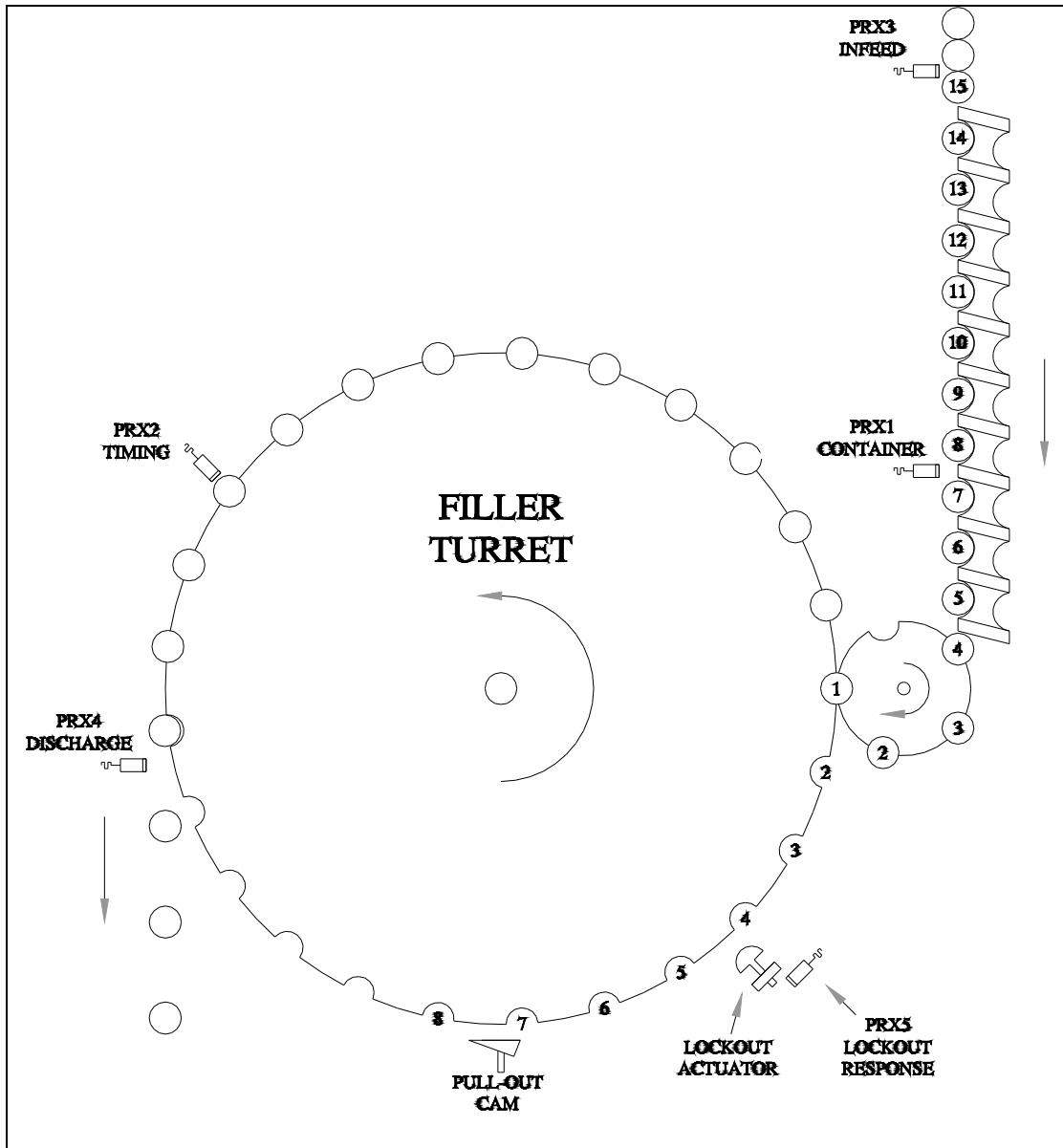
Figure 4-1 NC-NF / Filler Layout

SECTION 4
SETTING UP

4.1 SETTING UP THE SENSORS
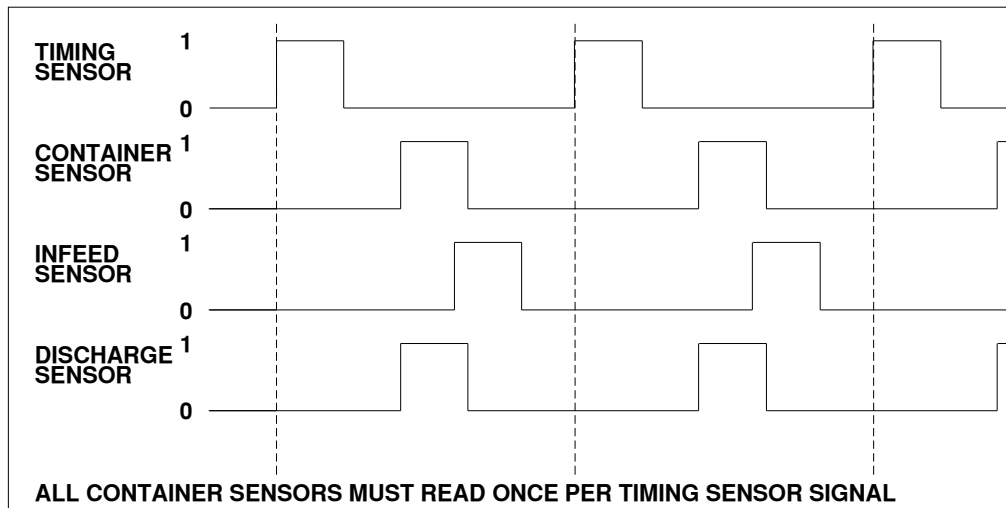
Figure 4-2 Input Sensor Timing Sequence

SECTION 4
SETTING UP

4.1.1 Verify Timing Sensor

4.1.1.1 Signal Expected

With the machine running, the Timing Sensor should pulse once and only once for every fill station.

4.1.1.2 Placement of Sensor

The Timing Sensor must turn "on" at the position the Lockout Actuator is to be tripped. This sensor can be placed anywhere on the periphery of the machine that will pick up the timing signal.

4.1.2 Verify Container Sensor

4.1.2.1 Signal Expected

The Container Sensor should turn "on" only when a container is present at its location, resulting in a single pulse per container.

4.1.2.2 Placement of Sensor

Count the number of stations between the Lockout Actuator to the point where containers are transferred to the filler turret. The Container Sensor should be located at least 3 (no more than 15) stations further from the transfer point than the Lockout Actuator.

Press the "T-C-T" key to bring up the Relative Timing display.

```
    CONTAINER RELATIVE TIMING = ##%
T - C - T     T ▓                      T
```

Using the Relative Timing display, verify that the container stays between the same two stations for the full speed range of the setup. This means that the relative timing number should not cross the 0/100 % threshold.

SECTION 4
SETTING UP

4.1.3 Verify Lockout Response Feedback Sensor

4.1.3.1 Signal Expected

With the Lockout Actuator fully retracted, the Lockout Response Feedback Sensor should be "off". Once the Actuator begins to extend, the sensor should turn "on". Note: If it is more convenient for mounting purposes to achieve the opposite action, simply reverse the input polarity of this sensor in setup parameter 14.

4.1.3.2 Placement of Sensor

Sensor should be placed on the Lockout Actuator in a way to give the signal expected.

4.1.4 Verify Infeed Sensor (Optional)

4.1.4.1 Signal Expected

The Infeed Sensor should turn "on" only when a container is present at its location, resulting in a single pulse per container.

4.1.4.2 Placement of Sensor

The infeed sensor should be located at the end of the infeed track, very near to where the containers are first loaded into the machine.

4.1.4.3 If the Pull-out Cam is controlled

Count the number of stations between the Pull-out Cam to the point where containers are transferred to the filler turret. The Infeed Sensor should be located at least 3 stations further from the transfer point than the Pull-out Cam. The Infeed Sensor should not be located more than 45 stations from the Container Sensor.

4.1.5 Verify Discharge Sensor (Optional)

4.1.5.1 Signal Expected

The Infeed Sensor should turn "on" only when a container is present at its location, resulting in a single pulse per container.

4.1.5.2 Placement of Sensor

Verify that the discharge sensor is located on the discharge track where the filled containers are discharged from the machine.

4.2 SETTING UP THE SYSTEM PARAMETERS

4.2.1 Navigating the Setup Menu

The Setup parameters for the NC-NF may be viewed at all times by pressing the "SETUP" key. When Setup Mode is accessed, the display for the last parameter will be called. The "PREV" and "NEXT" keys move to the Previous and Next parameters respectively.

4.2.2 Changing Setup Parameters

In order to change the parameter values, the Enable Setup Changes input at IN0 must be on. If changes are attempted and IN0 is off, the following will be displayed:

```
CHANGES IN SETUP ARE NOT ENABLED
CHECK MANUAL FOR SETUP PROCEDURE
```

If Changes are enabled, the values can be changed using the "INC" and "DEC" keys.

4.3 PARAMETER DEFINITIONS

Figure 4-3 Setup Parameters

P#	Parameter	Default	Min.	Max.	Units
1	Lockout Solenoid Lead Time (Extend)	45	1	150	ms
2	Lockout Solenoid Lead Time (Retract)	45	1	150	ms
3	Lockout Solenoid Response Time (Max)	150	15	250	ms
4	Stations from Container Prx to Lockout	3	3	15	stations
5	Auto Shift Timer	43200	1	64800	seconds
6	Lockouts to Extend Pull-out Cam	25	1	99	stations
7	Enable Optional Sensors	0	0	3	N/A
8	Stations from Infeed to Container	5	1	45	stations
9	Missing Containers for Infeed Jam	2	1	9	containers
10	Infeed Low Shutdown	5.0	0.1	600.0	seconds
11	Infeed OK to Restart	5.0	0.1	60.0	seconds
12	Stations from Container to Discharge	25	5	99	stations
13	Missing Containers for Discharge Jam	2	1	9	containers
14	Input Polarity	224	192	255	N/A

SECTION 4
SETTING UP

4.3.1 Lockout Actuator Lead Times (Extend and Retract)

```
       NC-NF SYSTEM IN SETUP MODE
1: LOCKOUT EXTEND LEAD TIME: ### MS
```

```
       NC-NF SYSTEM IN SETUP MODE
2: LOCKOUT RETRACT LEAD TIME: ### MS
```

Enter the values as measured by the Lockout Response Feedback Sensor as a starting point. To access the Lockout Response Feedback displays, press the "L/O SOL TIMES" key. "PREV" or "NEXT" will toggle between Extend and Retract. Note that the Lockout Actuator will need to have been tripped at least once for these values to be accurate. The default readouts are 45ms each way.

If the Lockout Actuator does not extend early enough to "hit" the lockout pin, increase the Extend Lead Time. Likewise, if the Actuator does not retract early enough to clear the next loaded station, increase the Retract Lead Time.

Note: if the measured time for either extend or retract is more than 20 milliseconds different than the setup value, a message will be displayed indicating this fact. This message is intended to alert the operator to changes in the response time of the actuator so that corrective action can be taken.

4.3.2 Maximum Lockout Response Time

```
       NC-NF SYSTEM IN SETUP MODE
3: LOCKOUT MAX RESPONSE TIME: ### MS
```

The measured response times for extend and retract will be checked against this limit to detect response time alarms. This is intended as a troubleshooting aid to let maintenance personnel know that there are mechanical response problems in the Lockout Actuator.

4.3.3 Number of Stations Container Sensor to Lockout Actuator

```
       NC-NF SYSTEM IN SETUP MODE
4: STATIONS FROM PRX1 TO LOCKOUT: ##
```

Count the number of stations between the Lockout Actuator to the point where containers are transferred to the filler turret. Now count the number of stations between the Container Sensor and the transfer point. This parameter should be set to the difference of those two numbers. If the Lockout Actuator is consistently hitting a complete station before or after the intended station, change this parameter.

4.3.4 Automatic End Of Shift Timer

```
       NC-NF SYSTEM IN SETUP MODE
5: AUTO SHIFT TIMER: ## H ## M ## S
```

The NC-NF stores production counts for filled containers and lockouts. These counts are maintained for the current shift, the previous shift and the lifetime of the system. In order to protect the integrity of the shift counters, the shift times must be limited. This parameter sets the length of the shift rollover time. The production counts can also be rolled over using the keypad or a remote input if desired. If the shift counts are updated by either of these means, the Auto Shift Timer will reset.

4.3.5 Consecutive Lockouts to Extend Pull-out Cam

```
       NC-NF SYSTEM IN SETUP MODE
6: LOCKOUTS TO EXTEND PULL-OUT CAM: ##
```

The Pull-out Cam resets the lockout pins for the next revolution of the filler. If a disruption of container flow exists upstream of the filler, the Pull-out Cam can be extended to reduce wear and tear on the Lockout Actuator and the Cam itself. The Cam will be retracted upon the first container detected. Enter the number of consecutive missing containers to cause the Pull-out Cam to be extended.

4.3.6 Enable Optional Sensors (Infeed and/or Discharge)

```
       NC-NF SYSTEM IN SETUP MODE
7: SENSOR ENABLE: # (1=IN,2=EXIT,3=BOTH)
```

The NC-NF software is written to include the optional Infeed and Discharge Sensors. In order to avoid nuisance alarms if these sensors are not installed, the installed sensors must be enabled for the related logic to be processed. To enable the logic related to the Infeed Sensor only, set this parameter to "1". To enable the logic related to the Discharge Sensor only, set this parameter to "2". To enable both sensors, set this parameter to "3". If either of the sensors is disabled, the related parameters will be included in the Setup mode display loop.

4.3.7 Number of Stations Infeed Sensor to Container Sensor [1]

```
        NC-NF SYSTEM IN SETUP MODE
8: STATIONS FROM PRX3 TO PRX1: ##
```

Enter the number of stations between the Infeed and Container Sensors. This information is used for detecting Infeed Jams.

4.3.8 Number of Missing Containers to Constitute an Infeed Jam [1]

```
        NC-NF SYSTEM IN SETUP MODE
9: CONTAINERS MISSING FOR INFEED JAM: #
```

Enter the number of containers lost between the Infeed Sensor and the Container Sensor before an Infeed Jam alarm is latched.

4.3.9 Infeed Low Timer [1]

```
        NC-NF SYSTEM IN SETUP MODE
10: INFEED LOW TIME: ###.# SECONDS
```

If no containers are detected at the Infeed Sensor for this long, the Infeed Low alarm will be latched, to shut the filler down.

4.3.10 Infeed Restart Timer [1]

```
        NC-NF SYSTEM IN SETUP MODE
11: INFEED RESTART TIME: ##.# SECONDS
```

Containers will be detected at the Infeed Sensor for this long before the Infeed Low alarm will automatically reset to allow the filler to run.

---

[1] These parameters will only appear if Infeed Sensor is enabled in Parameter 7 (Parameter 7 = 1 or 3).

4.3.11 Number of Stations Container Sensor to Discharge Sensor [2]

```
        NC-NF SYSTEM IN SETUP MODE
12: STATIONS FROM PRX1 TO PRX4: ##
```

Count the number of stations between the Container Sensor and the Discharge Sensor.
This information is used to detect a Discharge Jam alarm.

4.3.12 Number of Missing Containers to Constitute a Discharge Jam [2]

```
NC-NF SYSTEM IN SETUP MODE
13: CONTAINERS MISSING FOR EXIT JAM: #
```

Enter the number of containers lost between the Container Sensor and the Discharge
Sensor before a Discharge Jam alarm is latched.

4.3.13 Input Polarity

```
        NC-NF SYSTEM IN SETUP MODE
14: INPUT POLARITY --AFDITC: --#####
```

The NC-NF software is designed to handle PNP (24VDC = "1") or NPN (0VDC = "1")
inputs. The input polarity can be changed for all 5 sensors, plus the auxiliary contact
from the filler Main Drive. The Remote Wash-Down Bypass and Remote End of Shift
inputs are assumed PNP. The legend is given as a reminder of the schematic: (C =
Container Sensor, T= Timing Sensor, I = Infeed Sensor, D = Discharge Sensor, F =
Feedback Response Sensor, A = Auxiliary Contact from Main Drive). A "1" in the
Polarity Summary designates PNP, while a "0" designates NPN.

---

[2] These parameters will only appear if Discharge Sensor is enabled in Parameter 7 (Parameter 7 = 2 or 3).

5. DISPLAYS

5.1 ALARM MESSAGES

The NC-NF package detects the following alarms: Timing Sensor Failure, Lockout Extend Too Slow, Lockout Retract Too Slow, Container Detected in Wash-Down Bypass, Infeed Jam, Infeed Low, and Discharge Jam. If any alarm is detected, the system enable is turned off, and the drive to the machine should be disengaged. With no alarms detected, the system enable will be on and the drive to the machine should be enabled. The highest priority active alarm will be written to the display.

5.1.1 Timing Sensor Failure

```
          TIMING SIGNAL FAILURE
      CHECK SENSOR PRX2 AND RESET
```

The timing sensor is used to determine the period between fill stations and the speed of the machine. The time period between stations is tracked. If, after 3.0 seconds of the "drive running" interlock on, the current period between stations is 1.5 times greater than the previous time period, this alarm is latched. If this alarm is detected, make sure that the Timing Sensor senses **every** station.

5.1.2 Lockout Extend Too Slow

```
LOCKOUT EXTEND RESPONSE TOO SLOW - CHECK
PRX5 AND MAX TIME SETTING - PRESS RESET
```

This alarm is generated whenever the measured Extend Response time of the Lockout Actuator is greater than the setup parameter "Maximum Allowable Lockout Response".

5.1.3 Lockout Retract Too Slow

```
LOCKOUT RETRACT RESPONSE TOO SLOW -CHECK
PRX5 AND MAX TIME SETTING - PRESS RESET
```

This alarm is generated whenever the measured Retract Response time of the Lockout Actuator is greater than the setup parameter "Maximum Allowable Lockout Response".

5.1.4 Container Detected In Wash-Down Bypass

```
WASH-DOWN BYPASS FAILURE - CONTAINER WAS
SEEN AT PRX1 IN WASH-DOWN - PRESS RESET
```

When the NC-NF system is in Wash-Down Bypass Mode, production and lockout counts are bypassed. To maintain the integrity of these statistics, no containers should pass through the system while it is in this mode.

5.1.5 Infeed Jam

```
INFEED JAM - CONTAINER SEEN AT PRX3 BUT
NOT AT PRX1 - CHECK INFEED SCREW & RESET
```

The Infeed Sensor and the Container Sensor are placed in the infeed track to verify that containers are being fed into the machine. If containers are detected at the Infeed Sensor and are not detected by the Container Sensor (several stations later), the container is considered missing. After a user defined number of missing containers (setup parameter), an Infeed Jam is detected. If the Infeed Sensor is not enabled, this alarm is bypassed.

5.1.6 Infeed Low

```
NO CONTAINERS DETECTED AT PRX3 - CHECK
  PRX3 & CONTAINER FLOW - PRESS RESET
```

The Infeed Sensor is used to verify that there are containers to be loaded into the machine from the infeed track. If no containers are detected at the Infeed Sensor for a predefined period of time (setup parameter), the infeed low alarm will become true. The alarm will reset after containers have been continuously detected at the Infeed Sensor for a (setup parameter) period of time. This alarm is overridden in Wash-Down Bypass Mode. If the Infeed Sensor is not enabled, this alarm is bypassed.

5.1.7 Discharge Jam

```
EXIT JAM - CONTAINER SEEN AT PRX1 BUT
 NOT AT PRX4 - CHECK EXIT AREA & RESET
```

As containers are being fed into the machine, the container sensor determines the state of the fill station, (container or no container). The state of the fill station is tracked to the discharge of the machine. If filled containers are expected and the Discharge Sensor does not detect them, those containers are considered missing. After a user defined number of missing containers (setup parameter), a Discharge Jam is detected. If the Discharge Sensor is not enabled, this alarm is bypassed.

SECTION 5
DISPLAYS

5.2 LOCKOUT RESPONSE LOOP

As long as no alarms are active, the operator can view the Extend and Retract times measured by pressing the "L/O SOL TIMES" key. "PREV" and "NEXT" will toggle between the two displays. The display will reset after 30 seconds of no keys being pressed.

```
LOCKOUT MECHANISM RESPONSE AS MEASURED
LOCKOUT EXTEND RESPONSE: ### MS
```

```
LOCKOUT MECHANISM RESPONSE AS MEASURED
LOCKOUT RETRACT RESPONSE: ### MS
```

5.3 PRODUCTION COUNT LOOP

If system is in Wash-Down Mode or sitting on the Default Current Shift Display, the operator can view all 3 of the Production Count Displays by pressing "PREV" or "NEXT". These same keys will page through these displays. The display will reset after 30 seconds of no keys being pressed.

```
                PREVIOUS SHIFT
 FILLS: #,###,###    LOCKOUTS: #,###,###
```

```
        FILLER SPEED: #### CPM
 FILLS: #,###,###    LOCKOUTS: #,###,###
```

```
SYSTEM LIFE FILLS: ###,###,###
         LOCKOUTS: ###,###,###
```

5.4 RELATIVE TIMING DISPLAY

If none of the other feedback displays are active, the operator can view the relative timing of the Container and Timing Sensors by pressing the "T-C-T" key. This display will stay active until "T-C-T" or "Alarm Reset" is pressed (no 30-second timeout).

```
CONTAINER RELATIVE TIMING = ##%
T – C – T      T ▓                      T
```

The percentage represents the ratio of the time between the Timing Sensor and the Container Sensor over the period between Timing Sensor pulses. Minimum value is 0% (if both signals are detected at the same time). Maximum value is 99% (if the Container Sensor is detected immediately before the next Timing Sensor pulse).

5.5 OPERATOR KEYPAD REQUESTS

5.5.1 End of Shift

The operator can manually transfer and reset the current shift data using the "End of Shift" key on the keypad. When the "End of Shift" key is pressed, a confirmation is requested:

```
        END OF SHIFT REQUESTED
        ARE YOU SURE? (YES/NO)
```

Pressing the "Yes" key will transfer and reset the data. Pressing the "No" key will cancel the request.

5.5.2 Wash-Down Bypass Mode

The operator can manually enter Wash-Down Bypass mode using the "Wash-Down" key on the keypad. When the "Wash-Down" key is pressed, a confirmation is requested:

```
       WASH-DOWN BYPASS REQUESTED
         ARE YOU SURE? (YES/NO)
```

Pressing the "Yes" key will put the system in Wash-Down Bypass mode. Pressing the "No" key will cancel the request.

5.6 LOCKOUT ACTUATOR POSSIBLE PROBLEMS FEEDBACK

5.6.1 Lockout Actuator Response Too Long for Speed Compensation

If the measured response of the Lockout Actuator is longer than the period for two stations, the speed compensation function cannot operate properly. When this is first detected, a display will be triggered to notify the operator. If "Alarm Reset" is pressed, this message will not return until the condition goes away and returns.

```
LOCKOUT SOLENOID RESPONSE > 2 STATIONS
      PRESS 'RESET' TO ACKNOWLEDGE
```

5.6.2 Lockout Actuator Response Changing

If the measured response of the Lockout Actuator is more than 20ms different from the setup value being used, a display will be triggered to notify the operator. This is intended to notify the operator in changes in lockout actuation time - indicating faulty operation of the actuator itself. If "Alarm Reset" is pressed, this message will not return until the condition goes away and returns.

```
  L/O RESPONSE MEASURED <> SETUP VALUE
(CHECK SETUP VALUE) RESET TO ACKNOWLEDGE
```

5.7   WASH-DOWN BYPASS MODE

If the system is in Wash-Down Bypass Mode, and none of the feedback messages are active, the display will indicate the trigger for Wash-Down Bypass Mode.

```
  SYSTEM IN WASH-DOWN BYPASS BY REMOTE
```

```
  SYSTEM IN WASH-DOWN BYPASS BY KEYPAD
 PRESS 'RESET' OR 'WASH-DOWN' TO CANCEL
```

5.8   MESSAGE LOGIC ERROR

If the program, after a revision, contains an error in the message logic where a message is called for but not found, a display is provided for troubleshooting the problem.

```
MESSAGE LOGIC ERROR - MESSAGE NOT FOUND
NO MESSAGE ENTERED FOR B152 = ###
```

Appendix A -   Keypad Quick Reference

ALARM RESET   Resets all active alarms and displays.

L/O SOL TIMES   Triggers the Lockout Actuator Response Display Loop.

T-C-T   Activates the Relative Timing display.

END OF SHIFT   Transfers the Current Shift Production data to Previous Shift and resets the Current Shift. Must be confirmed.

WASH DOWN   Puts the NC-NF in Wash-Down Bypass Mode. Must be confirmed.

YES   Confirms "End of Shift" or "Wash Down" requests.

NO   Declines "End of Shift" or "Wash Down" requests.

SETUP   Activates the Setup Mode display loop.

NEXT   Moves display to next message in current display loop.

PREV   Moves display to previous message in current display loop.

INC   Increases the value of the Setup Parameter (if changes are enabled).

DEC   Decreases the value of the Setup Parameter (if changes are enabled).

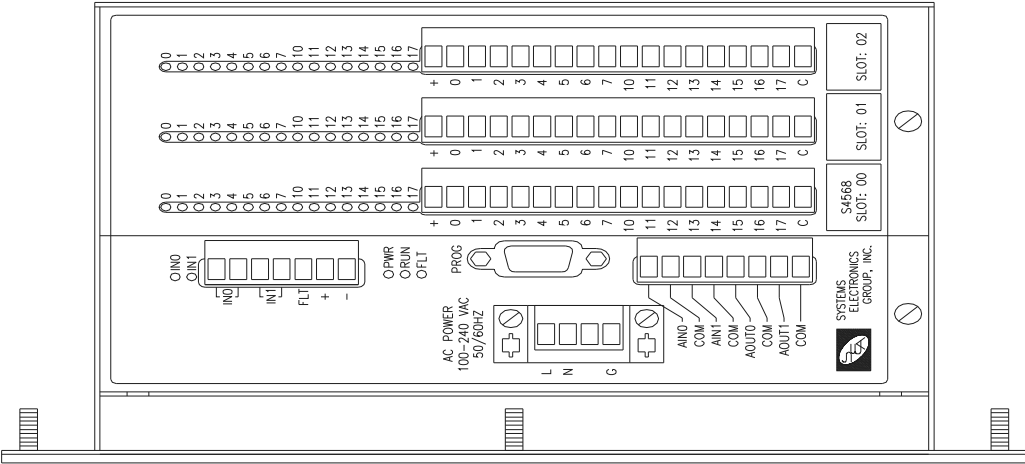# Appendix B -   M4502 Appearance Drawings
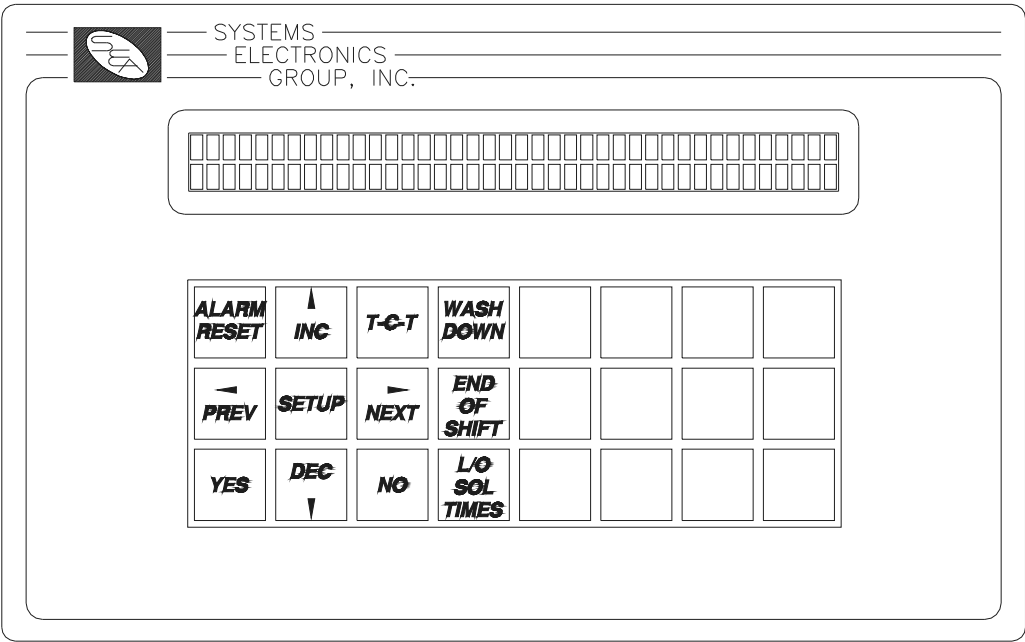

Figure B-1: Top View of NC-NF Controller

Figure B-2: Front View of NC-NF Controller

Appendix C -   Contacting Computrol

We at Computrol are committed to providing excellent technical support for our control systems. We are also interested in any comments or suggestions you may have toward improving these systems. If you need troubleshooting help, or just have a suggestion for an improvement, please feel free to contact us.

Computrol Service, LLC
2 W. Dry Creek Circle
Suite 100
Littleton, CO 80120

Phone: (303) 989-4417
Fax: (303) 989-4471

E-mail: sales@computrol1.net

Web: www.computrol1.net

Appendix D -   Schematics

The first sheet of the schematic used for this program (system) is included for quick reference. The information contained on the second sheet of the schematic is available in other parts of this manual.
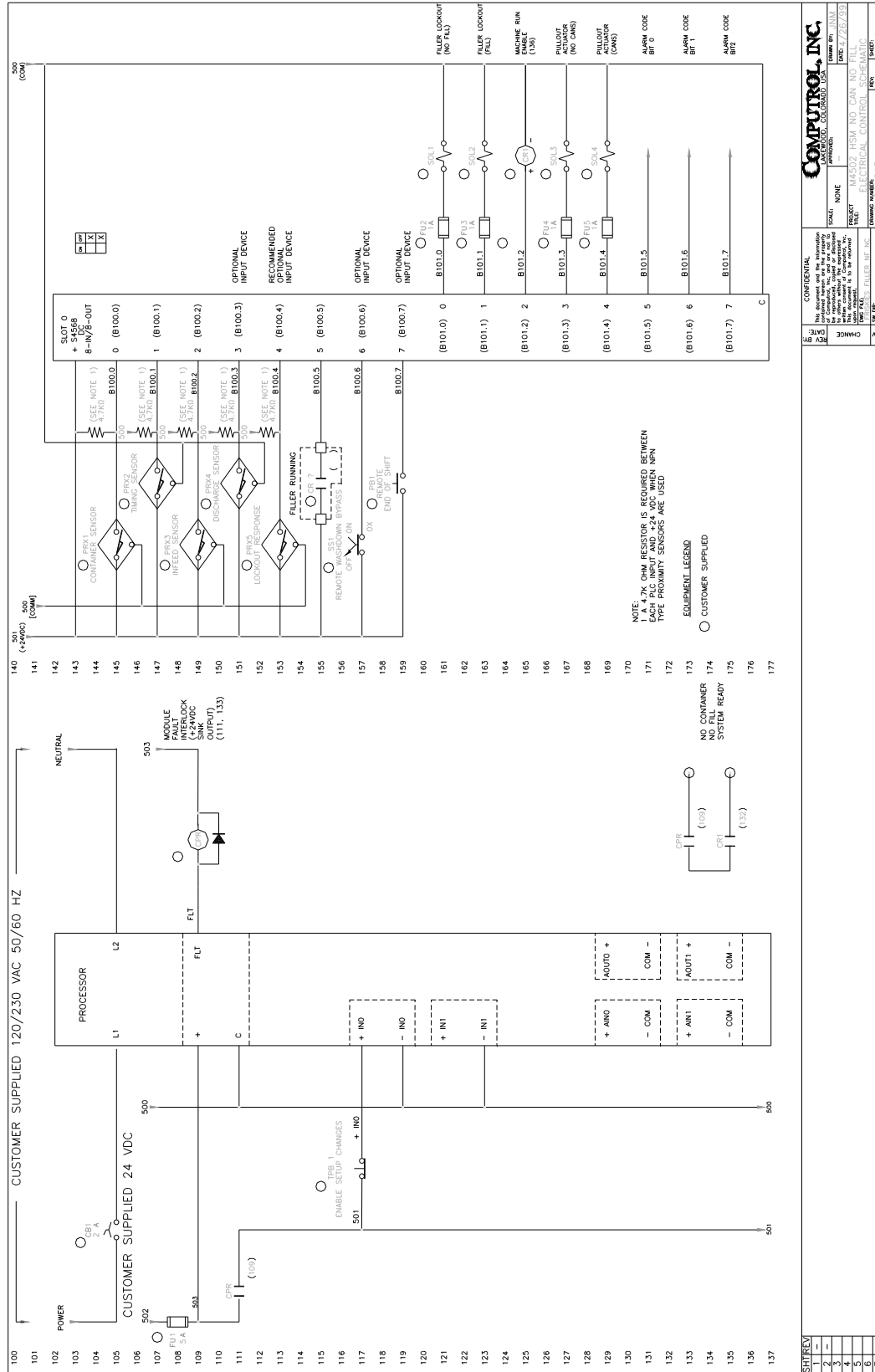
APPENDIX D
SCHEMATIC

Figure D-1: Schematic Sheet 1